Spring Suspension Mat

Description

Reference to Related Applications

This application is a continuation in part of PCT application PCT/EP 02/12299, filed on November 4, 2002, the entire contents of which are incorporated by reference herein. This application is also related to and claims the priority of German Utility Model 202 07 605.9, filed on May 15, 2002, the entire contents of which are incorporated by reference herein, and European Patent Application No. 03 010 551.4, the entire contents of which are incorporated by reference herein.

Field of the Invention

The invention relates to a spring suspension mat, more especially for the cushioning of seats and the like in accordance with the main preamble of claim 1.

Prior Art

FR 906 564 A makes known a spring base for seating which is a type of spring suspension mat in accordance with the main preamble of claim 1. Individual spring members are formed from spring-steel cross bands, one-piece spring parts being disposed with the spring members in such a manner that their height under load is reduced without influencing the remaining spring members. The spring members can be packed in plastics foam in the upholstery. On account of the bending radii of the spring members, the overall height nevertheless remains considerable, as the spring members continuously require a minimum height, if plastic deforming of the spring members is to be avoided in favor of the durability of the spring action. The spring members themselves are suspended in a support frame parallel to each other.

DE 317 362 C makes known a spring base for seating according to the main preamble of claim 1. Individual spring members are formed from spring-steel cross bands

and are then suspended parallel to each other in a pre-tensioned manner in a wire frame. The pre-tensioning as well as the separation between spring member and support member increases not only the overall height of the spring base. As the individual springs are not suspended together, not even in a row, displacements are produced which allow individual springs to be felt when sat upon. This effect is increased even more through the pre-tensioning of the spring members required in this case. Individual shaping of spring members is also known in DE 100 23 466 A1.

DE 24 00 992 A1 and DE 24 00 993 A1 show an upholstery made of inextensible material which receives its resilience via spring bridge portions. This consequently produces a deflection property in the surface, as because the individual members are not extensible, the desired point deflection is not produced. The narrowly spaced disposition restricts the deformability of the upholstery.

DE 659 903 C makes known a tension-loaded spring base with flat spring members. The tension-loaded spring members produce an uncomfortable, hard impression as they prevent the load being accommodated point-by-point in a resilient manner. In addition, there is no flat structure, which means that an additional framework is necessary.

Spring suspension members are also sometimes formed by the upholstery of seats, beds or the like, and have the job of making the user feel he is sitting on a soft surface (DD 20471). They can also be cushioned at the same time with spring members, as in WO 93/03652 A or DE 198 28 254 C2. A low, space-saving overall height is not possible due to the plurality of component members. However, if the construction of the spring member, as in FR 10 74 160 A or FR 12 68 632 A, is taken into three dimensions, the individual loops of this plastics material spring member are not springy on an individual basis which means that additional cushioning has to be provided by means of a framework.

A use of a spring suspension mat on a vehicle seat is known in DE 199 02 464 A1, where a plurality of flat supporting regions is provided which are connected, where required, to webs provided with springs. The entire structure has to be tensioned in a

framework. A similar construction is known in FR 27 59 649 A1 and DE 883 678 C. Springing is only possible in a surface manner, which means that it is also impossible to avoid tensile stress in the lower region. Consequently, the impression of sitting on something soft cannot be guaranteed as no spring means are provided transversely relative to the surface and no spring means are effective in a point-by-point manner. (Cf. also DE 19 16 968 U, for which there are no longer any illustrations; EP 388 542 A1).

A three-dimensional spring suspension mat is known in GB 1,042,112, where the mat is produced in one piece from plastics material. This mat cannot be adapted to arbitrary contours due the holohedral connection. In addition, the spring members are not individually deformable. In GB 2 055 173 A, contrary to this, in spite of a three-dimensional construction, there is no flexibility transversely relative to the spring member, as this spring suspension mat has wide, flat spring members. (Cf. also AT 405 481 B, DE 195 05 028 A1 and DE 92 00 114 U).

In the field of beds, the disposition of spring members situated perpendicularly relative to the lying surface is known in mattresses and bed bases (GB 614,272 and FR 15 80 446 A). Likewise DE 20 46 445 A also makes known disposing individual spring poles adjacent each other but only interconnecting them at the edge of the base. This leads to additional degrees of freedom and to bending under load, which means that the desired effect of a soft flat impression disappears. Solutions which are high in construction with at least resilient spring members which are not point by point are known in this field, for example, DE 79 29 543 U, DE 846 158 C, EP 972 470 A1, FR 955 776 A, WO 96/39906 A, DE 132 171 C, DE 132 558 C, DE 19 75 358 U, DE 20 15 659 C, DE 344 247 C, DE 357 703 C, DE 475 144 C, GB 614 133 C, GB 917 563 C, GB 934 658 C, WO 00/11989 A.

Summary of the Invention

Proceeding from this state of the art, it is the object of the present invention to create the desired impression, in an alternative manner, of sitting on something soft and saving space in so doing.

This object is achieved through the spring suspension mat with the features of claim 1.

The spring suspension mat comprises resilient spring members, which are disposed in an arbitrary disposition adjacent each other in one direction and are interconnected transversely relative to this direction. This is how the impression of sitting on something soft is created without any further auxiliary means. The achievement is, namely, as with upholstery, a member, which is resilient in the surface, providing suitable spring comfort. The individual spring parts yield in a point-resilient manner, where necessary, as far as the reduction to their material strength. The overall height of the spring suspension mat preferably even corresponds almost to the spring excursion. However, if a three-dimensional spring resilient member is desired, the mat can also extend in the third dimension. Nonetheless, the members can be used independently of other parts of the seat, which is of advantage, more especially, when the vehicle is recycled at the end of its life.

Metal spring-steel cross bands are preferably disposed adjacent each other and are interconnected transversely relative thereto by means of cross-struts or flat connecting means. This is how to create a construction, which is more flexible in the surface itself, is consequently also three-dimensionally deformable, and is formable into almost arbitrary three-dimensional contours. Through the transverse connections, the spring suspension mat is a unit, which can be used in construction and can nevertheless be adapted to any arbitrary fixed base support. A separate holding or tensioning frame is no longer necessary.

In a preferred specific embodiment, the spring suspension mat is used on a fixed base support. This fixed base support, such as, for example, a seat shell or the like, acts as the substructure for the spring suspension mat, which in contrast can still nevertheless be springy in the smallest space on account of its point resilience like the upholstering known up to now.

Further advantages are produced from the sub claims.

Brief Description of the Figures

The invention is described in more detail below by way of the enclosed Figures. In which:

Figures 1, 2 show a spring suspension mat shown in top view and in section,
Figure 3 is a spring suspension mat as a composite material shown in section,
Figure 4 is a sectional view of a spring member,
Figures 5-7 show another specific embodiment of a spring suspension mat preferably made of metal shown in section, top view and in a three-dimensional view,
Figures 8-10 show another specific embodiment of a spring suspension mat preferably made of plastics material and shown in section, top view and in a three-dimensional view.

Detailed Description of Preferred Embodiments

The invention will now be explained in more detail by way of example with reference to the attached drawings. However, the practical examples are only examples, which should not restrict the inventive concept to a specific arrangement.

Figure 1 is a top view of a spring suspension mat 10, as is more especially used for the cushioning of seats, preferably automobile vehicle seats. The use of the spring suspension mat is not restricted, however, to seating surfaces and back rests of all kinds of chairs such as office chairs, seats, sofas or automobile and airplane seats, but can for example also be used for beds or bicycle saddles. In principle, the cushioning mat is suitable for all types of use where resilient cushioning of surfaces, free of pressure points, is required.

In the case of this cushioning mat, spring members 11 are disposed adjacent each other and are interconnected for operative connection transversely relative to their longitudinal extension, that is relative to the first direction. The first direction extends

parallel to a surface of the chair, bed or the like, which is usable by a user. The spring members have spring parts 12a, 15a, which are slightly raised transversely relative to the usable surface. The spring parts 12a, 15a are, however, portions of the spring members 12, which are integral with the spring members, and are generally and continuously formed from the latter. Nevertheless the spring parts 12a, 15a are resiliently – so-called point resiliently - deformable, where required, individually, independent of each other and they are also deformable, where required, relative to the rest of the spring member. This deformability is facilitated by the spring parts not being pre-tensioned in the initial condition of the spring suspension mat 10. The spring members are interconnected for operative connection transversely relative to their first direction via connecting means 13, 14, 16 substantially parallel relative to the surface. Spring members 12, 15 and connecting means 13, 14, 16 can themselves be configured in a space saving manner consequently with no additional auxiliary means, which, on the one hand, makes three-dimensional constructability possible, but, on the other hand, makes a separate installation frame or tensioning frame superfluous. The spring suspension mat is preferably used on a fixed base such as, for example, a shell which corresponds to the desired shape, the disposition of the spring parts, nevertheless, giving the user the impression of conventional upholstery.

The spring members 12, 15 are preferably metal and consequently not difficult to recycle at a later date. More especially in the case of a metal embodiment, the mat – on account of the top material – is in all cases flame-resistant and not combustible, which is particularly significant in the construction of automobile vehicles and airplanes. Other materials, however, can also be used as long as the desired resilient characteristics are achieved. In principle, the spring members can be disposed adjacent each other in an arbitrary manner as long as it is simply guaranteed that a suitable force transference to achieve the desired spring comfort, that is to say the impression of sitting on something soft on the seat, is guaranteed. The spring members 12, 15 are preferably disposed substantially parallel to each other, as can be seen in Figure 2. In the exemplified embodiment, the spring parts protrude upwards from the spring members 12, 15; a reversed installation where the spring parts 12a, 15a, protrude downwards from the spring parts is also equally possible.

A spring suspension mat of this type will be a flat construction for the most part, which is also deformable, however, in the third dimension, where necessary, on account of the transverse connection by means of the connecting means, that is to say, for example, it is adaptable to the contour of a seat. If, however, a three-dimensional spring resilient member is desired, the mat can also extend in the third dimension. In this case, a connection between various spring members can also be effected in the third dimension. Through the transverse connections, the spring suspension mat is a constructible unit, which nevertheless adapts to any arbitrary fixed base.

The Figures show spring members 12 made from spring-steel cross bands with a width u. To achieve a better spring effect, the spring-steel cross band is bent upward to a height v in a loop-shaped manner. The height v of the spring suspension mat can be reduced down to 10 mm below or less mounting height without loss of the sitting-down or lying-down feeling striven for, which results in a construction which is extremely space and also weight saving, as the spring suspension mat is also the seating surface. Nevertheless there is good springiness precisely on account of the capability of the spring parts to fold-up. The overall height of the spring suspension mat corresponds namely almost to the spring excursion of the spring parts. The individual spring parts give way in a point resilient manner, where necessary, up to the reduction to their material strength without any plastic deforming occurring. Arbitrary overall heights are possible, however overall heights between 8 and 20 mm, preferably 10 mm are possible. This construction type consequently also results in an additional support, more especially where it is used in an automobile vehicle, as lateral movements are possible only over the overall height, which is an advantage compared to conventional upholstery.

To achieve an operative connection, these spring members 12 can be interconnected by means of a flat connecting means 13 (Figure 3). The connecting means can be glued to the spring members. It can be disposed on one side or on both sides of the spring suspension mat 10 with the spring members 12. In principle, for example, a central connecting means can also be in operative connection with spring members on both sides. The connecting means 13 can, for example, be in the form of a mesh, a layer, a mat or a film. In these cases too, a three-dimensional structure

can be achieved by means of disposing spring members and connecting means in a corresponding manner.

As an alternative thereto or in addition thereto, the spring members are interconnected preferably by means of resilient transverse struts 14. This connecting through transverse struts 14 is more especially suitable where spring-steel cross bands are used as the spring member 12. Compared to previously known spring suspension mats, this connection facilitates a three-dimensional formability of the spring suspension mat 10. In principle, it is possible to develop the spring conditions as being variously hard or soft by using different material strengths over the seating surface. In other words, various spring-steel cross bands can be used adjacent each other. This means that a specific springiness can also be achieved in a targeted manner internally of or within the surface.

The spring-steel cross band in Figure 1 has a different bending radius to the spring-steel cross band in Figure 4. This can also influence the resilience of the spring suspension mat. However, the smaller the bending radius, the better the respective loop, bend, diamond or the like made of spring-steel cross bands can spring inwards. If a small bending radius is selected, as, for example, in Figure 4, the bent members can be compressed with a resilient deforming as far as almost zero, more concisely put as far as approximately the material strength of the spring parts 12a in the direction of load transversely relative to the usable surface - in the exemplified embodiment three times the material strength of the spring parts 12a. However, as this occurs for each bend independently and in a varyingly strong manner depending on the load, this leads to the impression of sitting on something soft and free of pressure. Each spring part 12a, 15a has at least four, in the exemplified embodiment in Figures 4 to 10 five bending points, from which at least four are configured with a small bending radius in order to achieve the "folding-up" of the spring parts. Consequently, the individual spring part can be folded-up in places, which means that, when bending, on the small bending radii the material can be folded-up as far as its material strength. This leads to a large spring excursion with a small mounting height. The bending radii are designed in such a manner in this case that, nevertheless, there is no plastic deformation. This design imitates the design of a leaf spring, the external corner

points 12b, 15b being pressed approximately regularly outwards under pressure with the lowering of also the upper central point 12c, 15c. The compressive and tensile stresses generated at the same time in the upper and lower portions of the spring parts are eliminated substantially, which means that – if at all – small transverse forces are transferred into the members situated in the base surface themselves when used on a fixed base.

In the exemplified embodiments in Figures 1 to 7, the spring suspension mat has several strips with arbitrary widths and lengths as spring members 12. In place of the spring-steel cross bands, plastics materials or other resilient materials can be used, albeit preference is given to the metal spring member. The individual strips can be connected to the connecting means 13, 14 in the most varied of manners. A hollow rivet or a laser weld, for example, can be used for the connection between the spring members 12 and the connecting members 14. However, the spring members 12 can also be assembled, for example, as a plastics material injection molded part. A corresponding specific embodiment is represented in Figures 8 to 10. The spring members 15 rise out of a base surface 16. A corresponding part can be injection molded or can also be deep drawn from a plastics material part – or also a metal part – by way of plastic deformation.

In both cases, a holohedral sitting feeling with no noticeable pressure points, unlike previously known spring members or spring suspension mattresses, can be achieved by means of the tightly adjacent, high number of contact points in the direction of the surface "to be sat upon". Following assembly from individual members, the mat is suitable under load for any body shape, comparable to a water bed.

The spring suspension mat 10, for example comprising the spring members 12 and the connecting means 13, 14, can be constructed as a composite material which is used in seats, more especially in vehicle seats. This composite material can in its turn include parts of the vehicle seat such as the upholstery. The composite material can also be an integral component part of the vehicle seat or of parts of the vehicle seat.

The spring suspension mat is produced in all sizes and shapes, such as, for example, rectangular, square, oval, round, triangular and so on. The mat can be produced with defined sinking depths and hardness at arbitrary points, as for this purpose only a corresponding selection of spring members or their shape for these points or respectively at these points is necessary. The mat is very flexible and is suitable for all possible basic shapes depending on the area of application. To this end, the mat does not have to be additionally plastically deformed, for example through angling, bending or the same. The mat follows an arbitrary basic outline. Additional supports and/or shaped frameworks can be used, but they are not absolutely necessary as the spring suspension mat, where necessary, can be reinforced in itself and nevertheless still offers the desired spring comfort through the spring parts 12a, 15a. The spring suspension mat is preferably used on an arbitrary fixed base, such as, for example, a shell, perforated where necessary. On account of its design, it can be adapted to the contour, but due to the point resilience allows a springiness as with previously known upholsteries. For the same reason, the spring suspension mat does not lose its outer shape under compressive load as the pressure is absorbed by the fashioning of the individual spring members.

It is obvious that this description can be subject to the most varying modifications, changes and adaptations, which vary in the region of equivalents to the attached claims.